

Space Weather Forecast

Issued on Monday, 21 March 2022 at 12:40 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Slight solar radiation enhancement observed, else no significant activity.

Analysis of Space Weather Activity over past 24 hours

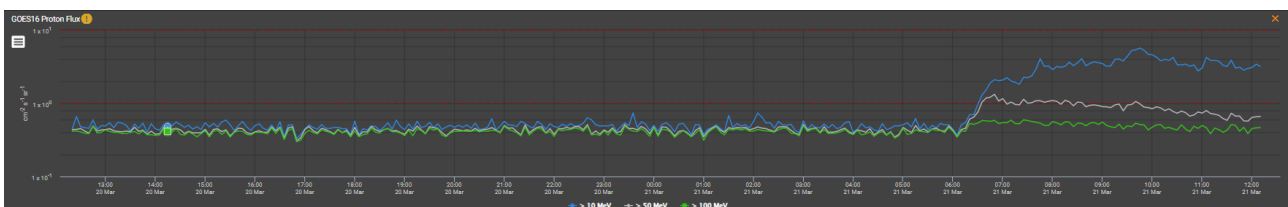
Solar Activity: Solar activity has been low over the past 24 hours, with a solitary small common-class X-ray flare observed at 20/1810UTC from a possible new sunspot region on the southeastern horizon of the sun. All other activity was otherwise below even this, with only two small and relatively unchanging sunspot regions on the sun at present.

An energetic far-sided Coronal Mass Ejection (CME) was seen on satellite imagery, heading comfortably away from the Earth ahead and below the track of its orbit with the source not visible from Earth. No Earth-directed CMEs were observed in the period.

Solar Wind / Geomagnetic Activity: The solar wind generally followed a slow regime, but with some slight early enhancements in some measures (number of particles and magnitude of associated magnetic field) that may represent a close pass from either the 16 March CME or perhaps a coronal hole. This enhancement has now ceased, and background solar wind measures have returned. Even at peak, geomagnetic activity was well below minor Storm G1, instead remaining mostly quiet.

Energetic Particles / Solar Radiation: Solar radiation showed an enhancement in the period, with this likely to be related to the far-sided CME-generating event mentioned above. At the time of writing, the 10MeV proton flux has peaked short of S1 at near 6pfu (S1 being 10pfu), while the 100MeV trace appears to have plateaued, having reached 1 particle every two seconds (short of the required particle per second for any alert/warning).

Figure 1: Past 24 hours in three different energies of solar radiation, with the enhancement tied to the far-sided CME clearly visible starting just after 21/0600UTC. All energy levels appear to have plateaued short of their associated alerts, with the ensuing hours determining whether this sustained or not.



Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is forecast to continue to be low, perhaps with a slightly increasing risk of significant flares with time as a result of possible active regions nearing the eastern solar

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horizon.

Solar Wind / Geomagnetic Activity: There is one CME (emitted 20/0745UTC) and one coronal hole fast wind in the current forecast. Both are due within day four (Thursday 24 March), both small in their own right but potentially combining to give a 10% risk of Minor Storm G1 at the very end of the period. Solar winds should otherwise be mainly quiet.

Energetic Particles / Solar Radiation: Solar radiation is expected to revert to Background levels after the current enhancement. This has most likely already peaked short of 10MeV/100MeV alert thresholds but will be monitored.

Being far-sided in origin, there is some difficulty in forecasting any repeat of such an event, as it is not clear whether the flare/CME was generated by a sunspot region (which may persist to emit again) or a 'filament' (an arc of plasma that generally disappears as a result). Given its apparently relatively solar pole-ward source, the latter is perhaps the more attractive hypothesis, and the risk therefore becomes very low after the first 24 hours.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	1	1	1	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	1	1	1	1
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} $\text{sr}^{-1} \text{s}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq \text{S1}$	No	5	1	1	1
Very Active	$\geq \text{S3}^*$	No	1	1	1	1
* $\text{S3} \geq 10 \text{ MeV} \geq 1000 \text{ pfu}$ and / or $\geq 50 \text{ MeV} \geq 10 \text{ pfu}$. ($\text{pfu} = \text{cm}^{-2}\text{sr}^{-1}\text{s}^{-1}$)						